

Conjugate Margins: An Exploration Strategy

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Summary

A new exploration strategy is being developed for the world's conjugate margins integrating high resolution 2D and 3D seismic with plate tectonic modeling and palaeogeography. The objective is to better understand the geodynamic evolution of conjugate margins by placing seismic within its geological context. This, in turn provides valuable insights in planning the location of future seismic surveys thereby reducing exploration costs and risk. Advances in plate tectonic modeling and paleogeography together with the latest deep seismic have made this possible giving a renewed sense of direction to the explorationist. A sense of direction that is defining the exploration strategy, not only for the exploration teams, but for companies and governments in general.

Introduction

Petroleum Geo-Services (PGS) is working with Getech to study this new exploration concept. The aim is to focus on the geological models associated with the conjugate margins and define the exploration fairways of these plays in the South Atlantic, Equatorial Margin and North Atlantic. PGS has extensive seismic coverage both 2D and 3D. In the South Atlantic Conjugate Margin alone, PGS has access to 200,000 sq km 3D and 300,000 km 2D in Brazil and 180,000 sq km 3D and 35,000 km 2D in West Africa (Figure 1). Getech provides the global plate tectonic model (Figure 2) which forms the base for both regional and global scale palaeogeographic reconstructions and palaeolandscape models. These present insights on basin geodynamics and juxtaposition of play elements, provide boundary conditions for paleogeographic mapping and allow reconstruction of exploration data (including seismic). The combination of the two will highlight proven conjugate margin geologic models and prospectivity.

Method

Using the existing seismic data, global paleo-reconstructions will be generated starting from the initiation of rifting and displayed for 105, 110, 115, 118, 120, 122 Ma year intervals. Existing seismic data positions will be reconstructed back in time to what their positions would have been at each of these date intervals (Figure 3). Seismic data that lines up at time of deposition will be interpreted focusing on the prospectivity of the specified geologic model.

Fixing the geologic model at times of deposition will outline the fairway of prospectivity. Three conjugate margins areas will be looked at for this study: the South Atlantic, Equatorial Margin and

North Atlantic. This presentation will focus on the South Atlantic and Equatorial Margins with some discussion on the North Atlantic. Templates will be constructed of successful conjugate margin discoveries creating a database of proven conjugate models. A prospectivity database will also be created to show the fairways of specific geologic reservoir facies. A fairway that can be used for an exploration strategy, capital business plans or government planning of resources.

Examples

Template examples will be shown from pre-salt discoveries and post-salt discoveries. The pre-salt will include the Lulu Field offshore Brazil (Oolitic Carbonate 5-8 bbls) and associated discoveries in Gabon by Harvest and Angola by Maersk and Cobalt. The post-salt will include the Jubilee Field Offshore Ghana (Turonian Sandstone 1 billion bbls) and associated discovery in French Guiana of the Zaedyus Field by Tullow. These templates will outline the remarkable similar geologic models of these plays at deposition before and after rifting.

Prospectivity examples will also be shown in the presentation to outline the potential that exists for conjugate margin plays. Prospects will be shown in the South Atlantic, Equatorial Margin and North Atlantic to give evidence of the large regional extent, consistent geologic model and defined fairway. This is a tool that can be used to define an exploration strategy.

Conclusions

Conjugate margin prospects are proven and prolific in their reserve potential. Understanding the geologic model and reconstructing the deposition history of the play can give great insights into the regional extent and structural framework. This geologic understanding is very important and lessens the risk in the exploration strategy. A successful exploration strategy is the key to finding reserves.

A company needs a strategy that is regional and offers multiple opportunities to find success. A portfolio of prospects is only as good as the growing inventory past what the company is currently working on. An exploration strategy needs to feed the inventory with low risk high reward opportunities. The conjugate margin offers the scope for prospects.

Governments can also benefit from understanding their conjugate margins. It helps them focus on what blocks to license, defines the resource plan and promotes the drilling and production of reserves. The resulting revenue stream aids the country.

The extent of the conjugate margin idea on exploration strategy is vast. It affects the geoscientist, exploration team, company and governments. There have been regional geologic models but none that offer a worldwide caliber opportunity.

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References

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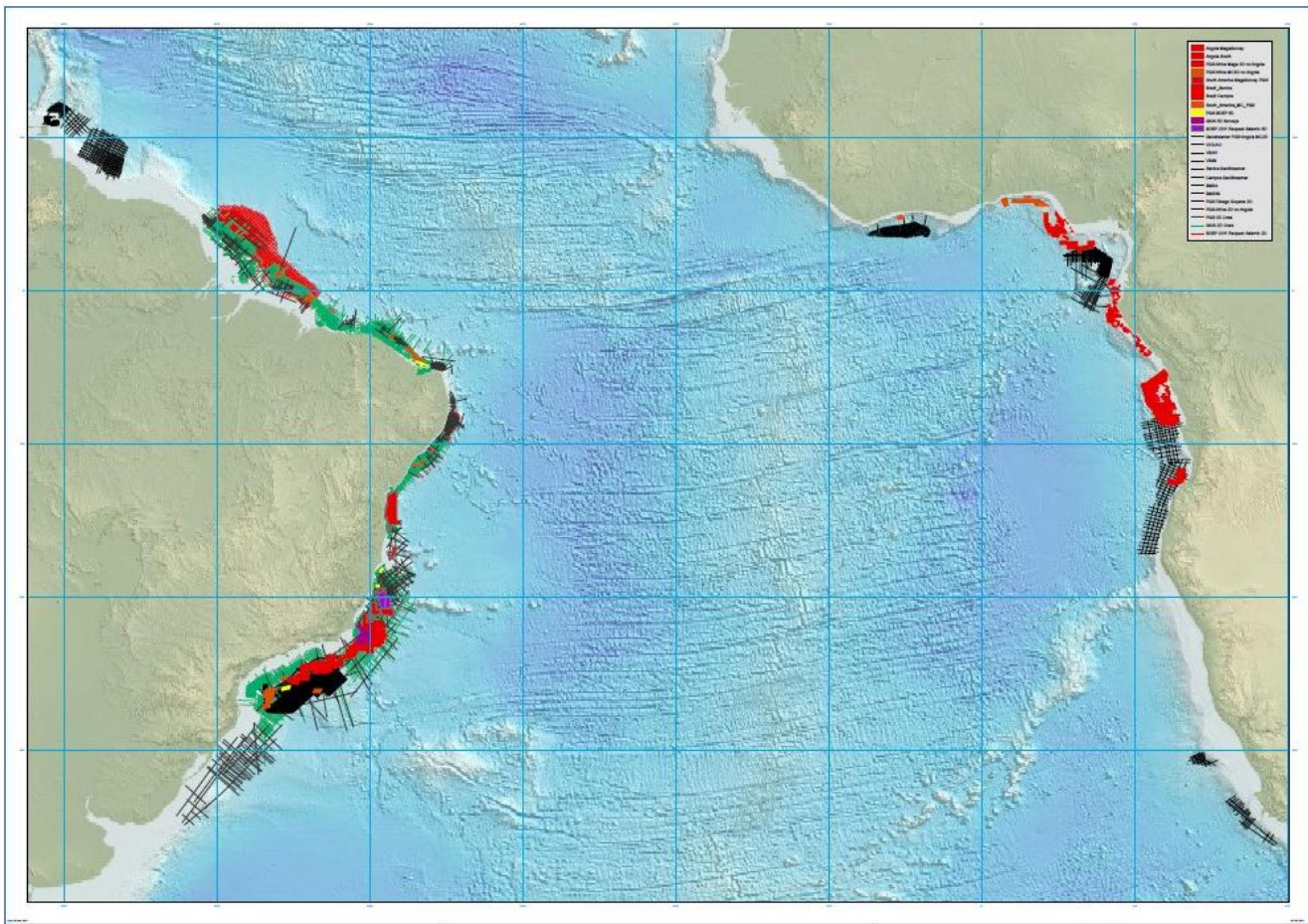


Figure 1: Seismic data South Atlantic Conjugate Margin



Figure 2: Getech global plate tectonic model

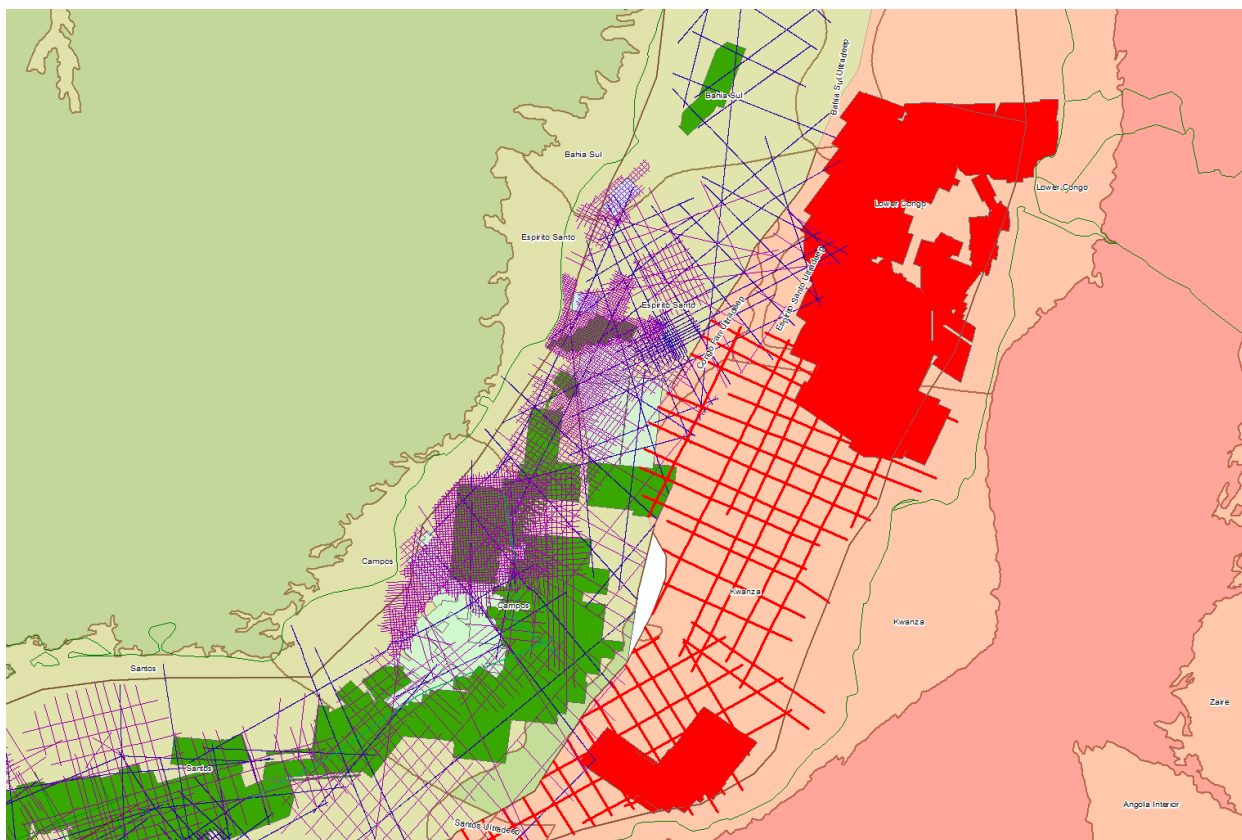


Figure 3: Reconstructed seismic to Aptian Time